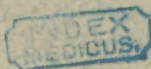
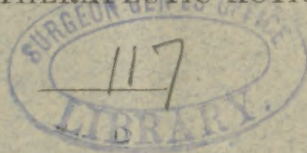


OPHTHALMIC OPERATIONS,  
WITH REMARKS ON AFTER-TREATMENT.

THE OPHTHALMIC USE OF QUININE,  
AND ITS THERAPEUTIC ACTION.



BY

A. SIBLEY CAMPBELL, M.D.,  
*AUGUSTA, GA.,*

Chairman of the Section on Surgery for the Eighth Congressional District, Medical Association of Georgia; late President of the Augusta Medical Society; Permanent Member of the American Medical Association; and formerly Demonstrator of Anatomy in the Medical Department of the University of Georgia.

REPRINTED FROM THE TRANSACTIONS OF THE MEDICAL ASSOCIATION  
OF GEORGIA, THIRTY-FIRST ANNUAL SESSION,  
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### THE OPHTHALMIC USE OF QUININE AND ITS THERAPEUTIC ACTION.

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The cases presented below will form the basis of certain remarks which I wish to make in regard to the after-treatment in cataract extraction and other surgical operations on the eye, together with a consideration of the therapeutical action of quinine—both generally, and in its special application in such cases.

CATARACT EXTRACTION—PERFECT RESULT—ULTIMATE

VISION =  $\frac{2}{3}$ .

*Quality of Cataract.*—I. J., from Norwood, Ga., about forty-five years of age; presented for examination December 1st, 1879. Has cataract in both eyes; hypermature (Morgagnian) of the right, and immature, lamellar, of the left. With the former he can only distinguish between very strong light and shade, and with the latter vision has finally become so much impaired that he can with great difficulty see to go about and attend to his work, and hence has sought relief by an operation.

*Previous History.*—From the patient's statements the following is gathered in regard to the history of his case. In 1868, while "dressing" a mill-stone, a particle of the rock or of the steel instrument, flew up striking him in the right eye and causing temporary blindness. The suspension of vision continued for several days, accompanied with photophobia, lachrymation and pain. The foreign body could not be found by those who attempted to discover and remove it. After the inflammation had subsided the eye "seemed to get well." Four years after the injury he observed that vision had begun to fail in this eye, and it has continued to grow worse ever since. In 1874, he began to have supra-orbital and ciliary neuralgia of the right eye, to which he was subject at intervals for four years; but for the last two years the attacks have not been so frequent or severe. The sight began to be obscured in 1873, and in the following year he could not see at all with the right eye. He noticed that vision in the left eye had begun to be affected some months ago, and it has, as stated, finally become so bad in this the remaining eye, that he has great difficulty in seeing sufficiently well to move about.

On minute examination of the right eye, the crystalline lens is seen to be densely opaque throughout, and of course does not give the least red reflex with the ophthalmoscope. This eye presents a beautiful specimen of the so-called "Morgagnian cataract," and the hard yellow nucleus is easily distinguished from the soft, pearly-white, opaque, cortical substance which surrounds it. The cortex being in a fluid state, while the patient is in the upright position the nucleus gravitates to the lower portion of the capsule, and being symmetrically oval in form, its upper margin is seen



as the arc of a circle extending across the lower third of the moderately dilated pupil, in the field of which we consequently have the appearance of a yellow segment of a circle below, and a white crescent above, clearly separated by the well-defined and regular curve of the upper margin of the nucleus. When the patient inclines his head to the right, the nucleus at once gravitates to that side, and a corresponding change in its position takes place when he bends his head to the left; so that the nucleus is seen to be almost as movable in the capsule as a pea in its pod. The anterior chamber is found to be perfectly clear: the iris in good condition, very active under different degrees of illumination, and responding readily to a weak solution of atropia; the retina also in a healthy state, as manifested by the cognizance of light. With oblique illumination a minute white spot is found on the anterior capsule, near the centre of the area of the pupil but somewhat to its inner side. This spot, of a much more absolute whiteness than the milky-white, soft, cortical substance in the background, has the form of a scalene triangle with apex downward, its apparent perpendicular length being about one millimeter and a half—the base directed upwards, somewhat less. This minute opacity had, no doubt, some connection with the original traumatism and consequent inflammation.

On examination of the left eye, a somewhat anomalous, immature, lamellar cataract is found, consisting of a central, anterior polar opacity, presenting the appearance, under oblique illumination, of an irregular, broken surface, with lines like wrinkles or cracks, radiating from the centre; it is elliptical in form with a major axis (vertical) of

about four millimeters and a minor (transverse) of about two and a half. In addition to this central opacity, with the pupil widely dilated with atropia, the ophthalmoscope shows a crescentic opacity in the outer periphery, extending from the superior to the inferior pole. Throughout the interior of the lens there is a diffused cloudiness with opalescent radiating lines of varying degrees of opacity; but there is a marked contrast between the obscuration at the centre and outer periphery and the rest of the area of the pupil; in the interspace between these, and especially to the inner side of the central obscuration, the red reflex of the retina can still be seen with the ophthalmoscope. It is <sup>upon the light</sup> through these very limited and clouded <sup>reflex</sup> positions of the lens of this eye that the patient has for some time been entirely dependent for his sight.

I decided to operate only on the right eye at this time, the cataract of the left being still immature. On this point Dr. H. Knapp, of New York, lays down the following definite rule: "Not to operate as long as, on ophthalmoscopic examination, the fundus yields a red reflex, however faint it may be; furthermore, as long as the patient is able to count fingers, after dilatation of the pupil, and as long as, by oblique illumination, in combination with a magnifying glass of great aperture, it can be ascertained that a part of the corticalis is still transparent." (*Archives of Ophthalmology and Otology*, Vol. VI.) This experienced operator shows by statistics the bad results of operating prematurely, on account of the tenacity with which the semi-transparent portions of the cortex adhere to the capsule, rendering it very difficult, or impossible, to remove them although with the greatest care. Besides, on the doc-



trine of chances, so to speak, as no foresight or skill can determine with certainty the ultimate result of a cataract operation, under ordinary circumstances, so long as there is the least degree of useful vision remaining in one eye while it is entirely destroyed in the other, I think it is evidently the part of prudence and wisdom to operate at first only on the latter.

*Operation.*—The method selected was the upper flap extraction, the patient being in the recumbent position, under chloroform, and the pupil partially dilated with atropia. The eye was steadied with Graefe's fixation forceps, and the lids held apart by the assistant's fingers.

*Incidents of Operation.*—During the execution of the operation, owing to the failure of the anæsthetic just at the critical moment, several very annoying incidents occurred rendering the termination of the case, at that time, extremely doubtful. The dangerous sequelæ, however, which usually attend such complications having been successfully combatted and the result being good, a statement of the difficulties encountered will, therefore, only add force to what I will have to say in regard to the excellent prophylactic effects of very careful and energetic after-treatment. The incision having been partially completed with Beer's knife, the influence of the chloroform suddenly abated—though at the initial moment complete anæsthesia had plainly been produced—and the patient, resisting, raised his head from the operating table. The anterior chamber having been by this time almost entirely emptied of aqueous and the iris rising over the edge of the knife, the chloroform was renewed and the incision completed, to a sufficient extent, with the straight probe-pointed knife.

The cystotome was not used, as amid the adverse circumstances which had arisen, the capsule ruptured spontaneously, which, with the straining of the patient and the decidedly hypermature character of the cataract, could easily account for its giving way without assistance; it is at the same time possible that it may have been touched by the knife as the patient changed his position. The soft, cortical portion of the cataract was expelled, accompanied by a small quantity of vitreous. The cavity of the lens having been thus nearly evacuated, and the hard nucleus changing its position to the centre of the pupil, it was then seen that a large corneal incision was not required; so, in completing the cut with the secondary knife, I only extended it to such a degree that the entire incision comprised about one-third of the corneal periphery, and extracted the nucleus with the curette, as—a second discharge of vitreous having taken place, though in neither instance excessive—I was unwilling to delay the closure of the eye at once, by attempting its removal by the usual method by pressure. The pupillary margin of the iris was slightly wounded by the knife when the patient moved his head during the primary incision, and a minute drop of blood was seen in the anterior chamber on the upper portion of the iris; this, however, gave no after trouble, and was not seen again when the eye was opened in the subsequent examination; for, being so small in quantity and diluted with the few drops of aqueous that remained, it formed no perceptible clot, and was no doubt speedily washed away by the out-flowing aqueous, as the latter was renewed and came away prior to the closure of the corneal incision. From the effects of the anæsthetic—although every precaution in re-

gard to diet, etc., had previously been taken to prevent it—the patient vomited twice during the operation; under which circumstances the small amount of vitreous lost was very fortunate. The immunity, however, was no doubt mainly due to the comparatively small corneal incision, which, resulting though it did from the unexpected incidents arising in the midst of the operation, seemed in this particular case to be determined by “a blessing in disguise.” A small piece of soft cloth was laid over each eye, on which a small quantity of cotton was placed, Liebreich’s bandage applied, and the patient removed to a dark room.

It should be stated, as bearing upon a point in regard to which there are so many conflicting opinions, that the incision was made in the transparent cornea, about one millimeter from the sclero-corneal juncture. So far as merely the length of the incision was concerned, it approximated that made in the operation of Von Graefe; though, besides not being symmetrically situated on either side of the superior pole of the iris, and Graefe’s knife not being employed, it differed from it, of course, in several particulars essentially constituting his operation; but being in clear cornea it really resembled more nearly the modification of Critchett. As it will be seen that I was afterwards obliged to perform a secondary iridectomy, the ultimate resemblance in the mere *traumatic condition* was still more nearly approximated.

*Healing Process and After-Treatment.*—December 3d, p. m. Directing light diet, left three morphine powders one-quarter grain each, to be given at proper intervals if required by pain or restlessness. At my visit the following day, found that the nurse had administered the three pow-



ders ; also that during the night the patient had vomited two or three times, whether from the after-effects of the chloroform, the morphine, the reflex influence appertaining to the shock of the operation, or all of these combined.

December 4th. Patient doing very well, without much pain.

December 5th. Comfortable, without pain. Removed bandage and applied fresh cotton, not allowing the eyes to be opened ; some watery discharge on dressings and cheek. Ordered ten grains quinine in five grain doses to be given to-day, and fifteen grains to-morrow in the same doses, during forenoon.

December 7th. Has been doing very well. Bathed lids with warm water, and applied with the drop-glass a few drops of a solution of sulphate of atropia, one grain to the ounce.

December 9th. He reports that he had some pain on the night after my last visit. No pain at present. Opened the eye ; he could see faces of bystanders. Found the conjunctiva injected and a considerable prolapse of the iris. Tried to replace prolapse gently with curette, some aqueous escaping in a jet, but did not succeed. Replaced bandage after bathing lids and applying atropia, four grains to the ounce.

December 11th. Eighth day after operation. Only about one-fifth of corneal incision at the inner angle united, iris protruding through the rest filled with aqueous, (hernia of iris). The other eye has not taken on any sympathetic trouble. On being questioned, rather to my surprise, he complains of no pain, in the proper sense of the term, though annoyed by the projecting sac of the iris, which, against

the palpebral conjunctiva, feels like a foreign body. Performed iridectomy without anaesthetic, with iris forceps and scissors curved on the flat, removing a sufficient portion of the iris which began at the pupillary margin, extending upwards and somewhat outwards; returned the angles as well as possible, and repeated the instillation of atropia. To insure greater chance of union, applied the compress bandage, and over this replaced that of Liebreich.

December 17th. Has been taking, up to within two or three days, fifteen grains of quinine per day; now ordered it reduced to ten grains. The margins of artificial enlargement of pupil smooth, yet some prolapse of the edges still existing, though it is much smaller than before. No iritis; removed compress and reapplied the outer bandage. No pain.

December 23d. For the hyperaemia of conjunctiva, applied a few drops of diluted fluid extract of ergot, about one drachm to the ounce of water; also repeated atropia and ordered quinine reduced to five grains every other day, as he had now been kept pretty well under its influence for some time. Removed bandage and applied large green shade to eye.

December 27th. The conjunctival hyperaemia—for which the ergot was applied—is now of a duller color, general appearance of eye quite improved; no pain at all. Patient has been out on the piazza and once to the business portion of the city, quite a long walk. Vision, on testing, found to be improving; the healing process continues to advance, plastic effusion covering slight prolapse more and more.

December 31st. Eye much improved; conjunctival con-

gestion still fading away; small prolapse contracted, and all of its surface covered over with plastic exudation. Sight much improved; with the eye operated on—the other eye being strictly closed—can see objects across long room pretty well. Applied ergot and atropia.

January 2d. Ordered quinine discontinued, of which, to keep up its gentle influence, he has been taking latterly, as directed, every other day a five grain capsule; and, altogether, it has been continued, in diminishing quantities, for about a month. The ergot was occasionally applied once a day for several days longer, and the atropia at increasing intervals until the patient was discharged. Condition of eye continues to improve.

January 12th. The eye having recovered very well from the operation, the situation of former prolapse having become quite smooth and covered over with plastic lymph and the cornea adherent, tested vision at my office with glasses of different powers. With bi-convex lens  $4\frac{1}{2}$ -inch focus, by Snellen's test-types,  $V = \frac{1}{60} = \frac{1}{5}$ ; and for nearer objects,  $V = \frac{2}{10} = \frac{1}{5}$ .

January 14th. Furnished patient with spectacles consisting of a lens  $+\frac{1}{4}$  for the right eye, and  $+\frac{1}{24}$  for the left, with which he is very much pleased; and though not yet fully accustomed to their use, counted fingers at 20 feet, and saw objects 50, 100 and 200 yards distant.

On the following day gave the eye a thorough examination. Has quite a good pupil, somewhat oval in form; the upper lid falls just over and conceals the cicatrix and the upper margin of the pupil, making the eye appear, unless under close observation, as if there had been no change. The minute white spot on the anterior capsule—which ex-



isted before the operation, and which I did not attempt to excise with a portion of the capsule, during the operation, for fear that further operative measures might cause a dangerous loss of vitreous—does not interfere with vision; the patient says he does not see it at all. To account for this, it may possibly coincide with the optic disk, or “blind spot” of the retina, which being, according to Helmholtz, 1 mm. 81 in diameter, exceeds the apparent size of the spot—its real dimensions being still less when we exclude the magnifying effect of the aqueous. With this infinitesimal exception, the field of the pupil is perfectly clear, the retina in good condition, the fundus giving a healthy red reflex. The pupil, including the slight artificial coloboma, is perfectly smooth, healthy and free from exudations or synechiae. The patient was discharged January 16th; but having an opportunity, three days afterwards, of testing his vision, to determine whether this brief habituation to his glasses had caused an improvement, I found by Snellen,  $V = 1\frac{1}{2} = \frac{1}{4}$ , which shows a progressing increase, which the ultimate vision will no doubt very much exceed. He can also read Jaeger Nos. 16 to 20, with varying degrees of facility. Even the immediate result may, therefore, be classed as good, according to the classification of Dr. Knapp, who regards the results of cataract operations as *good* when  $V = \frac{2}{3}$  to  $\frac{2}{3}$ ; as *moderate* when  $V = \frac{1}{3}$  to  $\frac{2}{3}$ ; and as *failures* when  $V < \frac{2}{3}$ .

*Ultimate Vision.*—Six months after the operation, the patient's vision, on being carefully tested, shows an improvement which far exceeds my expectations. With the eye operated on, he can now see well enough to read the finest type, *i. e.*, the “diamond” size of printers, or No. 1 Jaeger.

at twenty inches; and for more distant vision,  $V \frac{20}{20} = 1$ , *i. e.*, he has normal acuteness of vision in this eye, with the aid of his cataract glass; and—as I have just been written—he can, of course, “see well enough to do any work on the farm.” Besides reading No. 20 Snellen at twenty feet, he read also No. 30 at thirty feet; thus, fully standing the test as far as it was carried with the two sizes of Snellen’s types at hand at the time of the examination.

CONVERGENT STRABISMUS—OPERATION, WITH CORRECTION OF DEVIATION.

*History.*—N. L. J., six years of age, the little daughter of Mr. S. A. J., of Millen, Ga., has monolateral, convergent strabismus of the left eye, the deviation being about three lines in extent. She has had “cross-eye,” her mother states, since she was eight months old; and this coincidence of its beginning, just at the ushering in of the period of the primary dentition, readily suggests the supposition that it had its origin in some of the manifold reflex phenomena which so often arise at this time. When about two years old, she had one or two convulsions, some error of diet being assigned as the exciting cause; which also indicates her predisposition to nervous and muscular affections from reflected peripheral irritation. Her health, otherwise, has been generally good. She has not been able to learn the alphabet “on account of the running together of the letters”—diplopia from failure of muscular accommodation.

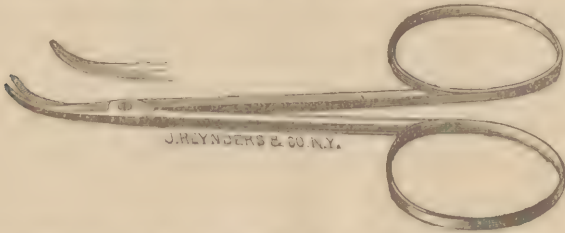
*Operation, etc.*—November 13th, 1879, performed the usual operation of Von Graefe, dividing the tendon of the internal rectus close to its insertion in the sclerotic with the strabismus scissors curved on the flat, the patient under chloroform and the lids held apart with Desmarres’ retract-

tors. The tendon was found to be rather narrow but quite thick. The immediate effect of the operation being satisfactory, it was found unnecessary to apply a suture or to operate on the other eye. A little circumstance to which my attention was not called until the last moment, just as I was about to operate, would perhaps have caused me, had I known it before, to defer the operation to another time. On the palmar surface of the patient's hands were noticed several isolated, indolent-looking pustules — which might be classed as ecchymatous — indicating a slight dyscrasia at least, and which, I apprehended, might delay the reparative process. This, however, gave no trouble, as the incision healed without difficulty. As an alterative, I prescribed a preparation of tartrate of iron and potassa and iodide of potassium, which she took for two weeks, with great increase of appetite and an improvement of her general health. Quinine was also given in appropriate doses for two or three days, to prevent any febrile reaction that might occur. She returned home two days after the operation, and I was kept informed in regard to the condition of the eyes from time to time, learning four months afterwards that the permanent result was excellent, as the obliquity was entirely relieved.

The strabismus scissors usually sold as such by instrument manufacturers are too heavy, and the rings for the fingers are too small to enable them to be used conveniently in the proper plane with the surgeon's hand: this principle being recognized even in the manufacture of the ordinary domestic scissors for cutting cloth, many of which being intended for delicate feminine hands, shows that it is not a question of the size of fingers. Besides, when it is desirable to



produce only a slight effect, the large blades are not so convenient. The accompanying cut represents a very delicate pair recently made for me by Messrs. John Reynders &



Delicate Strabismus Scissors, with enlarged rings. About two-thirds the actual length.

Co., of New York, in which I have combined the advantages suggested by different authors—the form, size and degree of curvature of the blades being after Wells, the slightly shortened shank and enlarged rings after Haynes Walton, who calls particular attention to the advantages of the latter features.

#### PTERYGIUM—THE RHOMBOIDAL EXCISION OF ARLT WITH SUTURES.

Hypertrophy of the conjunctival and sub-conjunctival tissues—on account of its superficial situation, and the frequency of its occurrence in the lighter forms—though perhaps regarded as trivial in comparison with affections of the deeper structures of the eye, becomes of greater moment and interest when the growth is excessive, and has taxed the ingenuity of ophthalmic surgeons to devise methods for its successful removal. Not only is the pterygium liable to return, but there may also be left after the operation, as the result of the healing process, a fibrous or tendinous cicatricial tissue, which may undergo progressive contraction. “A perfect cure of pterygium,” says Stellwag, “is by no means a frequent occurrence.”

Besides the discomfort to the patient arising from the

elevation and tension of the hypertrophy, and its objections in a cosmetic point of view, when the corneal portion has advanced to the area of the pupil as it sometimes does, though rarely further than its centre, the integrity of the cornea may thus become affected and vision ultimately impaired by the formation of a nebula or leucoma. Such general treatment as that by the local application of astringents etc., can only be expected to prove occasionally beneficially in the incipient stages or in very mild forms. Of the three methods of operating—by excision, ligation and transplantation, the first was used in the following case which may perhaps, possess one or two other points of interest.

Mr. H. W., of Sylvania, Ga., sixty years of age, has pterygium and cataract of both eyes, both affections being much more advanced in the right, in which it is excessive. His eyes have never sustained any traumatic injury. It is probable that the conjunctival affection—in addition to the ordinary predisposing causes, such as protracted exposure for years to strong sunlight in those otherwise liable to hyperæmia of this membrane, he being a farmer—has been mainly determined by the existence of the cataract, from the constant straining and consequent irritation of the eyes in endeavoring to obtain satisfactory vision with the great disadvantages under which he labors. This suggestion is strengthened by the comparative coincident degree of the cataract and pterygium in each eye. The lens of the right eye was uniformly opaque, with the exception of a portion of the upper and outer quadrant, which, though cloudy, was not so densely obscured, and enabled him, with this eye, to barely distinguish the shadow of the hand passed at

a short distance before the face. The left lens was seen with the ophthalmoscope to be cloudy throughout, and the reflex was a brownish red; with oblique illumination the appearance was somewhat changed, as the opacity then seemed to be more dense, more decided in the centre, and to be principally in the capsule or in the anterior layers of the cortex. In addition to the annoyance of the pterygia, his vision was thus very much impaired. The patient, however, having come to the city for only a day or two, and not being able to remain long enough for a cataract operation, and, besides, the most advanced cataract being not yet quite mature, this operation was, for the time, deferred. To give him relief in the meantime from the large pterygium, and to prevent its central portion from encroaching further upon the cornea, over which it had already made a considerable advance, as I wished to prevent the possibility of any corneal opacity when he should return for the cataract operation, I removed the pterygium by excision, employing in the operation the little device of Arlt to ensure a neater coaptation of the edges of the wound and lessen the liability to a prominent and contracting cicatrix. The lids being held apart by the stop speculum, the corneal portion was removed with the curved blunt-pointed scissors, and two incisions were made with the round-pointed scarifying knife from the corneo-scleral juncture along the two edges of the pterygium above and below, extending about two lines outward; these were then made to converge until they met in the transverse median line of the growth, leaving the portion towards the semilunar fold to be removed by atrophy. The wound thus left was approximately of a rhomboidal form, and its lips were brought together by two



sutures of very fine China bead silk. Quinine was prescribed for two or three days. I saw the patient three or four months afterwards, and the result was very satisfactory: and though, under prolonged exposure or after unusual exertion in the sun, that portion of the conjunctiva was somewhat more sensitive than the rest, it showed no appearance of cicatricial tissue, and the patient was very much pleased with the relief afforded by the operation.

REMARKS ON AFTER-TREATMENT IN CATARACT AND OTHER  
OPHTHALMIC OPERATIONS.

The gratifying result obtained in the preceding case of cataract extraction under the difficulties encountered, may serve as the basis of some considerations as to the subsequent course of treatment in cataract operations, which are applicable also in regard to various other ophthalmic operations, and sometimes, too, to the treatment of certain affections of the eye in which an operation is not involved.

It will be seen that notwithstanding the fact that union of the corneal flap did not take place by first intention, but that adhesion was for sometime delayed by the considerable prolapse which occurred, and which necessitated a secondary iridectomy, there was no iritis or keratitis—except to such a very slight degree as constituted an essential part of the adhesive inflammation of the reparative process—although both extensive iritis and suppurative keratitis might well have been apprehended from the imprisonment of the iris for several days between the lips of the corneal incision, shutting off the corneal flap for the time being from its direct nutritive supply. There was, besides, a remarkable freedom from pain. All of which, together with the for-

fortunate result, was, I believe, largely due to the persevering after-treatment.

Besides the careful seclusion from light until all danger had passed, and close attention to all the other details of regimen usual in such cases, the therapeutic treatment consisted chiefly as stated, in *the prolonged use of quinine, with topical applications of atropia and ergot*, at appropriate intervals, according to the varying condition of the eye during the progress of the healing process.

### QUININE AND ITS MODUS OPERANDI.

Among the manifold applications of this valuable agent in diseased conditions throughout the system, it is especially applicable in abnormal conditions of the eye, whether these have resulted from disease—local, reflected or centric, from traumatic injuries, or from surgical procedures. The beneficial influence exerted by quinine in ophthalmic affections, is due (and not only here, but in its various applications throughout the body) to its action on the vascular system; restoring the proper tone of the vessels, enabling them to contract and regain their normal calibre, when atony and, consequently, blood-stasis exists, relieving hyperæmia and engorgements, and thus preventing, limiting or relieving inflammation. Besides this action on the local circulation of the organ itself, the same effect is simultaneously exerted on the entire circulation, and, with the rest, on that of the nerve-centres, both cerebro-spinal and sympathetic\*, so that the general febrile and other reactive processes, liable to occur after surgical operations, are either warded off en-

\* *Vide* "Report on the Nervous System in Febrile Diseases, and the Classification of Fevers by the Nervous System." By Henry F. Campbell, M. D., Transactions American Medical Association. Vol. X., 1857, p. 455, and Vol. XI., 1858, p. 349.

tirely or modified in their intensity; and, again, the sympathetic ganglia, presiding over the local vascularity and nutrition, through the same tonic influence on their own circulation, receive, no doubt, at the same time a renewed impulse in aiding the blood-vessels of the local circulation of the organ to overcome the hyperæmia, stasis and their various sequelæ; so that we have both locally and generally, at the centre and at the periphery, in the organ and throughout the system, as long as the agent is continued, or its effects remain, an influence exerted, hostile to congestion, inflammation, suppuration, and the long train of special symptoms and conditions which they either include or may develop.

No satisfactory and comprehensive explanation of the action of quinine is to be found in our text-books on therapeutics. "How it acts," says Ringer, with reference to intermittant fever, "is at present quite unknown." Various theories have been advanced by different authors, but none of them are sufficient to cover all the ground when we consider its almost unlimited application. The views briefly given above—in regard to its operation in the special sphere which concerns us here—are deduced from the theory of its general therapeutic action as proposed by Dr. Robert Campbell, of Augusta, and published in 1858-9. In the *Southern Medical and Surgical Journal*, February, 1858, he suggests that "it is a disseminator or equalizer of the *circulation*, and acts by dispersing, wherever found, all vascular accumulations, possibly *by giving tone to the vascular tissue*, and that it has control over the nervous system, under such circumstances, by dispersing such engorgements in its centres." In further development of his views, he



subsequently states, that "quinine exercises its primary action upon the middle or fibrous coat of the blood-vessels, and that upon its influence in that tissue all its observed effects depend." He then elaborates this theory in the following succinct propositions, which were presented to the Medical Association of Georgia in April, 1859:

"*First.* That quinine does not act *primarily* upon the nervous system.

"*Second.* That its effects upon the nervous system are neither those of a stimulant nor sedative.

"*Third.* That its manifest, uniform phenomena are at variance with those of any known neurotic.

"*Fourth.* That there is no concordance between the degree of its *apparent* influence over the nervous system and the size of the dose, as obtains with all neurotics.

"*Fifth.* That its phenomena are varied in character and degree, more in accordance with an associate condition of the *vascular*, than of the nervous system.

"*Sixth.* That its action is *primarily* exerted upon the VASCULAR SYSTEM, by a specific agency directed to the fibrous coat of the vessels, and having the power of condensing or contracting that tissue—probably by chemical union with its elements, similar to that of the vegetable astringents. By virtue of this property, it overcomes all engorgements of the vascular system—*by constringing the vessels.* Thus, it relieves, entirely or partially, all those diseases which depend upon engorgement, resulting from vascular exhaustion or debility, such as would proceed from relaxation of the middle coat—whether occurring in a vascular organ, as lung, spleen or liver—or in a nervous centre, as brain, spinal marrow, or ganglion.

“*Serenth.* That this interpretation is the only one which can furnish a satisfactory explanation of the phenomena consequent upon the administration of quinine.”—*Southern Medical and Surgical Journal, August, 1859.*

This theory in regard to the action of the agent constitutes a comprehensive generalization of its operations throughout the system; and when minutely analyzed, carefully considered, and followed throughout all the ramifications of thought to which it will lead—and it will lead us in its elaboration as far as and in every direction that the circulation extends—it will elucidate many obscurities; and little difficulty, I think, will then be found in accounting for the beneficial results accruing from the use of quinine in the multifarious and sometimes apparently diverse phenomena for which it is rationally, though often empirically, employed.

Such being the action of quinine on the vascular system at large, the explanation of its therapeutic influence in abnormal conditions of the eye follows as a corollary. But, of the entire system the organ of vision presents us with the most beautiful field for testing its effects and its efficiency. So delicate in its structure, and so highly endowed with sensibility, it readily responds to all the influences, good or bad, which are exerted upon it. Its disorders are not effectually concealed from observation like those of other extremely delicate organs hidden away within the organism; for, so perfectly adjusted are its parts, that if one suffers injury or impairment, the whole, as a rule, becomes deranged; and its visible limiting membranes present us, as it were, with a series of living charts, to read thereon—so far at least as vascular and inflammatory changes are

involved—the signs and symptoms of its condition, by the delicate tablets of the conjunctiva and cornea, of the iris, and of the retina.

A striking illustration—through the evidences of the retinal image—in regard to the action of quinine on the blood vessels, and which serves as a very valuable substantiation of the theory above referred to, was furnished in a paper presented by Dr. A. H. Voorhies, of Memphis, Tenn., to the Section on Ophthalmology, of the American Medical Association, at its meeting in Atlanta, in 1879. In this case, enormous doses of quinine, which had been ignorantly administered by a non-professional person, caused not only great contraction, but an obliteration apparently of the delicate retinal vessels. As the case is a very unusual one, and of great interest in this connection, I will state it fully by extracts from the report: “February 16th, 1878, I was asked,” says Dr. Voorhies, “to see Miss V. H., a young lady, aged eighteen, living on the Arkansas side of the Mississippi, twenty miles below Memphis. Arriving at the residence, I found the patient in bed, with every appearance of being extremely ill. The history, as briefly given by Mr. and Mrs. M., at whose house she was a visitor, was, that one week before the date of my visit, under the apprehension that this lady was threatened with a congestive chill, a relative who happened to come in (not a physician) caused an ounce of quinine to be administered to her within the space of a few hours; and that a like quantity was given each day for the two following days. In other words, more than thirteen hundred grains were given by stomach and rectum within three days. On the morning of the second day it was discovered that she was per-



fectly blind. At the time of my visit, which, as stated, was one week afterward, I found her extremely prostrate, hardly able to move her fingers, with feeble pulse, and barely able to comprehend the simplest question when addressed, while heretofore she was noted for sprightliness of intellect. There was marked paleness of the face, and this was also noticed in the conjunctival lining of the lids. Pupils normal, responding promptly to light. T, 1 : anaesthesia of cornea, so as to suffer a probe moved about over its surface without complaint. No perception of light."

*"Ophthalmoscopic view very peculiar, disk perfectly white, not a trace of optic nerve vessels—neither veins nor arteries—choroidal vessels empty, with pale yellowish tinge of retina."*\*

Dr. Voorhies then mentions the treatment employed—consisting of nitrite of amyl by inhalation, stimulants, tonics, but principally of strychnine hypodermically—and continues, "still no improvement of sight was discovered until the middle of the tenth week, when she was able to discern a trace of light on the use of the ophthalmoscope. The return of sight was very gradual, until she was, and is now [May 1879], enabled to read Jaeger No. 1. I had the opportunity of examining this case a few days ago, and find the disk perfectly white, with still no trace of central artery except a small twig, which is just perceptible as it struggles over the upper half of the disk of the left eye, to be lost on reaching the retina. The field of vision is greatly contracted, and in chalking it out at this time, I find the greatest—which is the vertical—diameter, to be less than four inches when taken at two feet. Her general

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\* The italics are mine.

health is good, and her mental activity is fully restored." (*Trans. Am. Med. Association*, vol. 30, 1879.)

Further comment in application of the forcible testimony derived from this *experimentum crucis*, in regard to the *modus operandi* of quinine, by increasing the tonic or contractile power of the middle or muscular coat of the blood-vessels, is scarcely necessary. I was at once struck with the significance of the case in its bearings on the theory of Dr. Robert Campbell—which I have long regarded as the true rationale—when I first heard the report of the case last year, at the meeting of the American Medical Association. The careful and interesting details of the condition induced by the excessive, and no doubt unprecedented, quantity of quinine administered, plainly indicate both the effects of the agent on the vascular system in general, and on the delicate and minute circulation of the retina in particular, where the condition could be detected and interpreted by the aid of the ophthalmoscope.

Although far from attempting to bring forward at the present time the long array of arguments which may be adduced in support of this interpretation of the action of quinine, I will call attention here, before leaving the subject, to the results of a series of experiments, which I find on record, performed on the lower animals under vivisection, by Dr. Pagis, *Interne* of the hospitals at Paris, for the purpose of determining the effects of sulphate of quinine on the spleen—a highly vascular organ and abundantly supplied with fibro-elastic tissue—and originally published in the *Gazette des Hôpitaux*. "In a middle sized dog the spleen was uncovered by two incisions perpendicular to each other. The transverse diameter of the viscus measured

twenty centimetres, and the longitudinal six. The jugular vein was opened, and twenty-three grammes of aleoolat \* of quinine was injected; instantaneously the spleen diminished in every direction, its surface became rough and wrinkled, and its diameters were respectively reduced to fourteen and five centimetres. In another animal the experiments were repeated, with a view of comparing the results of several kinds of injections: with water they were negative; with alcohol the spleen was very slightly corrugated; but with the solution of quinine the viscus contracted instantaneously in the most evident manner." †

In view of these tangible and very notable effects produced by excessive quantities of the agent, its gentler action and beneficent influence, in therapeutic doses, will be more readily understood in connection with the foregoing discussion.

"*The more active the vessel,*" says Virchow, "*the less the supply of blood.*" Again, "the phenomena of contraction exhibited by the vessels must be referred solely and exclusively to the action of the muscular fibres"; but, further on, he says, that the equable onward movement of the circulation is effected by the elastic constituents of the vascular walls. And, elsewhere, in another connection, the same author states, "we are irresistibly compelled—both by the consideration of simply pathological, and particularly by that of pharmaco-dynamical, phenomena—to admit that there are certain *affinities* existing between definite tissues and definite substances, which must be referred to peculiar—

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\* An alcoholic tincture of the *Codex Medical* of Paris, the strength of which is not stated.

† *Southern Med. and Surg. Journal*, April, 1847, republished from the *Medical Times* and the *Medical News*.



ities of chemical constitution." The application of these principles to corresponding points of the argument, is easy.

Farquharson also testifies that "the remarkable enlargement of the spleen which attends intermittent fever is often so rapidly diminished by quinine as to make it probable that the reduction of bulk is due to *an active contraction of the substance of the organ itself.*" \* In the two instances above given, I have made reference to experiments and observations on the spleen, not because quinine has any specific action on *this* organ *per se* above others; but merely because from its spongy, parenchymatous structure and large supply of blood vessels and fibrous tissue, it serves as an excellent and convenient criterion for measuring the effect on the *vascular system* in general. The author last quoted sets a high estimate on the value of quinine and makes a just adjudication, when he says: "In any comparative estimate of the absolute importance of various drugs to the human species, cinchona would probably take the second place, the first being, by universal consent, accorded to opium." Again, he states: "Quinine . . . has in recent years obtained so much of the careful attention of physiologists that we are bound to consider its properties with as much care and precision *as the present state of science allows.*" And yet, throughout the discussion of the physiological and therapeutical action of quinine in his work, which is an admirable epitome of the action of remedies, and which I here use as a fair reflex and representative, in synoptical form, of this branch of medical science at the present time—much of the material of which, as the author states, has been freely drawn from the systematic

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\* Farquharson's Guide to Therapeutics. Woodbury. Am. Ed. 1877. The italics are mine.

works of Stille, Neligan, Garrod, Ringer, Wood, Bartholow, Phillips, Thorowgood, Nothnagel, Royle and Christison, supplemented by assistance from the writings of Brunton, Handfield Jones, Fraser, Fothergill, John Harley, Anstie, Broadbent, Liebreich, and many others—there is nowhere, in the valuable and interesting presentation of the remedy, either given or attempted, a *generalization* of its action. This wide-felt deficiency I beg leave here to supply, by again calling the attention of the profession to the satisfactory explanation presented by Dr. Robert Campbell in 1858-9. In reiterating, then, the interpretation of this author at the present time—with perhaps some slight addition of my own to the theory—I may state my views as follows: That the prominent and specific action of quinine is due to its direct influence on the vascular system through its power of contracting the blood-vessels—acting thus on their middle or muscular coat, and hence on the unstriped, assisted, possibly, by the elastic fibres constituting that structure. That this action is *primarily* on the blood vessels—especially on the small arteries, where muscular fibre predominates—and without the intermediary action of the vaso-motor system. That possibly the vaso-motor system afterwards aids in the process of contraction; but, if so, only secondarily, by the same general influence now exerted, with the rest, on its own circulation. Hence, the action of quinine on the vascular system is that of a *constrictant*, and (if I may be allowed to give the expression a new application) its effects may be termed *syntoniac*. \*

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\* This term seems peculiarly appropriate here, not merely from its derivation (*suntino* — *con-stringo*), but also from the fact that it is similar to, and has the same origin as, *syntonine*, one of the old names for fibrine.

larial fevers is due to this same influence, contracting the arterioles and preventing congestion of the nervous centres and internal viscera by its administration during the interval; whereby the vascular tubules themselves are enabled to equalize—or, rather, *to preserve the equality of*—the blood supply, inhibiting and repressing the determination which would otherwise occur with the oncoming paroxysm. If this be true, the cabalistic terms “specific” and “antiperiodic” will no longer be necessary to cloak our ignorance in regard to its invaluable effects in controlling febrile diseases, particularly intermittents and remittents—nor the *ultima thule* of our horizon, in assigning its definite nature. The element of *periodicity* involved in the question, is inherent in the nature of *the disease*; whereas, in the essential action of the agent itself there is no absolute relation to *time*, or the recurrence of times. It has no mysterious power here, differing from its general action elsewhere; it becomes inimical to periodicity in idiopathic paroxysmal fevers, simply because it is exhibited just in time to get the system under its influence in order to forestall the threatened central congestion—the proximate cause and *ipse morbus*—which reaches its acme during the cold stage, after which the rebound to the external surface brings on the hot stage, or in common parlance “the fever” proper. In this connection, then, its action may be termed *anti-congestive*—which is still merely a logical outgrowth of its *constringent* action. Quinine, therefore, *is* “a specific,” but—of a condition, and not of a disease, or of a limited class of diseases; and that condition is congestion, and its cognate states—under whatever forms they masquerade.

Among the physiological effects of quinine, the observa-

tion has been made that it exerts an influence on the white corpuscles of the blood, "checking their amœboid movements, and arresting their tendency to migrate through the walls of the capillaries under inflammatory conditions." (Farquharson.) This is attributed to "a direct action" on the white corpuscles themselves. It may be more readily explained as an *indirect* action on the corpuscles through the *direct contraction* and condensation of the tissues of their containing vessels. I cannot refrain from quoting in addition the interesting therapeutical application which the author derives from the observation just stated, (and which is not affected by this difference of opinion as to the antecedent cause,) viz.: that, as "an essential part of inflammation and suppuration is now known to be extrusion of the white blood corpuscles from the capillaries, and their subsequent transformation into pus-cells, quinine may therefore be of great service in localised inflammations, and in checking exhausting discharges from abscesses or wounds."

It is proper for me to state, in connection with my own remarks on the surgical uses of quinine, that for many years, Dr. Henry F. Campbell, with whom I have been for some time closely associated in practice, has been in the habit of employing quinine, for several days at least, as a regular course of after-treatment, subsequent to all surgical operations. In the therapeutical treatment of diseases of the eye also, he has always given to this agent a prominent place. He was the first, I believe to inaugurate the employment of quinine as a systematic and almost unvarying plan of after-treatment, not only in surgical, but in obstetric practice also; and has for a long time laid great stress upon



the importance of this prophylactic course in his lectures at the Medical College of Georgia—a school which, through the writings and lectures of several of its teachers, has contributed much towards the present just appreciation of the value of quinine, and has thus been greatly instrumental in enlarging the sphere of its usefulness.

#### INSTILLATIONS OF ATROPIA.

The great value of sulphate of atropia as a topical application in ophthalmic practice is well known—not merely as a mydriatic for diagnostic purposes, when such assistance is found necessary; but for its use also in various affections of the eye, where it often constitutes a most important factor or adjuvant of treatment. In many inflammatory conditions, where the iris is prominently involved, whether resulting from disease, or from traumatism, accidental or surgical, it is a great resource—paralyzing the sphincter fibres and enabling the radiating, through the now unopposed action of the sympathetic, to dilate the pupil—or, perhaps, by an additional excitation of the latter fibers, according to Wells' interpretation of Ruete's observation—at the same time lessening the tendency to prolapse in corneal lesions, diminishing ocular tension, preventing the formation of posterior synechiae and, besides, soothing the inflamed organ by the gentle narcotic influence of properly graduated instillations. One of its most conspicuous benefits, then, is through its power of giving *rest* to the inflamed, irritable and—otherwise—restless iris. Hence, its great advantages after cataract operations as recommended by Wells, Stellwag, and other systematic writers. The property is also assigned it of contracting the small vessels, and in speaking of mydriatics the latter author says: "It

is certain that the power of producing paralysis, is only one factor; the other, and perhaps the chief factor, is the vigorous contraction of the vessels in the anterior portion of the ciliary region, which is undoubtedly accomplished by mydriatics. Thus these remedies, with some restrictions, become entitled to a place among the true antiphlogistics.\* Fothergill, also, states that "belladonna contracts the peripheral arterioles in many parts of the body."† And Farquharson further suggests that "to this contracting influence on the small vessels is probably due the effect of belladonna in checking local inflammatory conditions."‡ We thus see the great benefit that may be derived from the application of atropia after ophthalmic operations, not only in giving rest to the iris, but in its tendency to produce local depletion of the eye.

#### THE LOCAL APPLICATION OF ERGOT IN AFFECTIONS OF THE EYE.

I have been very much pleased with the effects of the local application of ergot in some affections of the eye. During the last year or two this use of the agent has been recommended in various articles which have appeared in journals. In general terms, it has seemed to me most beneficial in cases where, from whatever cause, an acute hyperæmia of the conjunctiva exists, with or without catarrhal secretions. In some cases its action is remarkably prompt, as it is rapidly absorbed by the conjunctiva, and then acts locally on the dilated vessels of that membrane by virtue of its general property of contracting the blood vessels. Furthermore, this influence is no doubt not confined to the

\* Stellwag on the Eye. Am. Ed., p. 35.

† Practitioner's Hand-Book of Treatment, p. 301.

‡ Guide to Therapeutics, p. 128.

superficial circulation of the conjunctival and sub-conjunctival tissues, but is probably transmitted also to the circulation of the sclerotic, iris, ciliary body, choroid and retina, by anastomosis—"the conjunctiva being chiefly supplied by the palpebral and lachrymal arteries, which form a thick network indirectly connected, through the episcleral around the corneal margin, with the ciliary system;" besides, "the sclerotic receives blood from the ciliary system.....and contains around the optic nerve-entrance the posterior vascular zone (of Zinn or Haller), formed from twigs of the short ciliary, which sends branches to the optic nerve, anastomosing with those of the central artery, thus forming the only connection between the ciliary and retinal systems;" and, again, "on the anterior surface, around the cornea is the anterior vascular zone—formed from the episcleral or sub-conjunctival branches of the anterior ciliary vessels—which anastomoses with the conjunctival vessels." (*Rossa and Ely*). Finally, all these small branches are derived from the same artery—the ophthalmic. In this way we can readily see the means of communication between the superficial and the deeper circulation, which becomes more open and direct in the dilatation of inflammatory conditions. Hence, the local application of ergot would be indicated in the deeper seated lesions also—even those in which the uveal tract and retina are implicated.\*

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\*To call attention, in this connection to the decided absorbent qualities attributed to the external structures of the eye, I may note here the statement which Wells makes in regard to atropia as a mydriatic, viz: "That the action of the atropine is due to its absorption through the cornea, is proved by the experiments of Von Graefe, who withdrew some of the aqueous humor from the eye of a rabbit, the pupil of which was dilated by atropine, and applying it to the eye of another rabbit, it was found to produce dilatation of the pupil." If even this smooth and horny membrane does, thus, so easily permit endosmotic action—though, even here, I may imagine some assistance at least

As an illustration of its use in conjunctival affections, I may mention a case of exanthematous ophthalmia in which it was very happily employed. In April 1879, Mr. B., a gentleman of Augusta, who was just convalescing from a very severe attack of measles and had been out only a day or two, although the general manifestations of the disease had subsided, was still left with a very decided and troublesome conjunctivitis. There was photophobia, lachrymation and great enlargement of the vessels of the ocular conjunctiva throughout its extent, the intense redness giving the eye a most fiery, "boiled-lobster" appearance. I prescribed the following:

R.—Extract. ergot. fluid. . . . . ʒi.  
 Aquæ rosæ . . . . . ʒviij.

M. ft. collyrium. S. To be dropped in the eye two or three times a day.

Quinine was also advised in five grain doses three times a day. Under this treatment the hyperæmia, with its accompanying symptoms, was so speedily relieved that the collyrium was discontinued on the second day, and after only three or four instillations. In some cases I have used only half a drachm of the fluid extract to the ounce of

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through the intervention of the episcleral and general conjunctival circulation—we may *a fortiori* readily understand how solutions of ergot—even if they should be regarded as less penetrating than atropia—may be taken up by the mucous membrane of the ocular and palpebral conjunctiva—the latter being provided, too, with papillæ and the orifices of its follicular glands—and thus carried into the ocular circulation. As qualifying, however, to some extent this passing suggestion of mine as to the vascular absorption and portability of atropia, I must add the fact that Donders, in numerous experiments on the human eye, found that "the younger the individual and the thinner the cornea, the more rapid was the action" (Wells). Still, it might be argued again, on the other hand, that in this event all the other tissues would, in all probability, also be thinner, more delicate, and thus more liable to absorb the solution and carry it in through the blood vessels.



water, occasionally adding a small quantity of some of the mineral astringents, such as one or two grains of acetate of zinc, when such an addition seems to be required; though I am generally glad to be able to call into requisition so harmless and efficient a *vegetable* astringent, unaided, in such cases as it seems sufficient to control.

My attention was first particularly directed to this use of ergot by Dr. J. S. Coleman, of this city, who having already tried it, on the recommendation of journal articles, had been very much gratified with its results. I have since seen a valuable article on "The Topical Uses of Ergot," by Dr. William O. Dabney, of Charlottesville, Va., in the *American Journal of the Medical Sciences*, for July, 1879, in which the subject is considered in relation to diseases in various portions of the body, beginning with the eye. Dr. Dabney states that attention had been previously called to this use of ergot, especially in acute ophthalmia, in the *Journal de Therapeutique*, by M. Planat, of Nice. A typical case is related by Dr. Dabney, that of a little girl ten years of age who had been suffering for a week with conjunctivitis, before he was applied to for treatment. There was then "quite a free discharge of muco-pus from the eyes, and the bloodvessels of the conjunctiva were considerably enlarged, the membrane itself being somewhat thickened and opaque. The treatment directed was the frequent cleansing of the eye with warm water, and the instillation after each washing of a few drops of the following solution: Ergot (solid extract) grs. x; glycerine, f. ʒj; water, to make f. ʒj. M. There was a very manifest improvement in a few hours, and in three days the eyes were well."

Having thus seen by the experience of others, in addition to my own, the benefits to be derived from the topical use of ergot in general hyperæmic conditions and catarrhal affections of the conjunctiva, I was led, by an easy transition, to try its effects in the after-treatment of surgical operations on the eye; and believe that I can highly recommend it as a useful auxiliary, for its speedy action in limiting and finally relieving the hyperæmia and traumatic conjunctivitis—and, perhaps, the more deeply seated inflammatory processes also—which are liable to complicate any operation on the eye.

#### CONCLUSION.

In conclusion, it will be seen from the foregoing, that the three agents whose action has been here briefly considered in their relation to affections of the eye—viz: quinine, atropia and ergot—besides the other important benefits derived from their use, act conspicuously—each in its proper sphere—by preventing, limiting and relieving inflammation. Hence, in cataract operations especially, they constitute a valuable course of antiphlogistic treatment; meeting and controlling the various inflammatory reactions, by a species of gentle local depletion—in which, from its systemic as well as local influence, the chief factor is quinine.

